

**What is claimed is:**

1. In a system for the detection of surgical implements having a marker attached thereto, the marker exhibiting mechanical resonance at a resonant frequency in response to the incidence thereon of an alternating electromagnetic interrogating field, whereby said marker is provided with a signal-identifying characteristic, the improvement wherein said resonant frequency ranges from about 70 to 300 kHz.
2. A surgical implement detection system, comprising:
  - a) a marker exhibiting magnetomechanical resonance at a resonant frequency in response to the incidence thereon of an alternating electromagnetic interrogating field, said resonant frequency ranging from about 70 to 300 kHz, whereby said marker is provided with a signal-identifying characteristic;
  - b) an interrogating means for generating said electromagnetic interrogating field having a preselected interrogating frequency, modulated as a series of pulses;
  - c) a detecting means for detecting said signal-identifying characteristic; and
  - d) an indication means activated by said detecting means in response to the detection of said signal-identifying characteristic.
3. A system as recited by claim 2, wherein said marker resonates at said resonant frequency and radiates a marker dipole field in response to incidence of said interrogating field; and said signal-identifying characteristic is a ring-down of said dipole field.

4. A system as recited by claim 3, wherein said marker further comprises:
- a) at least one magnetomechanical element providing said mechanical resonance, said resonant frequency being substantially equal to said  
5 preselected interrogating frequency;
  - b) a bias means for magnetically biasing and thereby arming said magnetomechanical element to resonate; and
  - c) a housing enclosing said magnetomechanical element and said bias means,  
10 wherein said magnetomechanical element is free to mechanically vibrate in said housing at said resonant frequency.
5. A system as recited by claim 4, wherein said magnetomechanical element comprises at least one elongated strip composed of magnetostrictive amorphous metal alloy.
- 15 6. A system as recited by claim 5, wherein said magnetomechanical element comprises a plurality of elongated strips composed of magnetostrictive amorphous metal alloy.
- 20 7. A system as recited by claim 6, wherein the centers of said strips are substantially coincident.
8. A system as recited by claim 6, wherein the orientation of said strips is non-parallel.
- 25 9. A system as recited by claim 8, wherein: said bias means comprises a bias magnet having a top side and a bottom side; said magnetomechanical element comprises a first elongated strip and a second elongated strip, each of said

strips being composed of magnetostrictive amorphous metal alloy; said first elongated strip is disposed on said top side and said second elongated strip is disposed on said bottom side of said bias magnet; and the planes of said first and second elongated strips are substantially parallel.

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10. A system as recited by claim 9, wherein said first and second elongated strips are in substantially parallel orientation.

11. A system as recited by claim 6, wherein each of said strips has substantially the same resonant frequency.

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12. A system as recited by claim 1, wherein said resonance frequency ranges from about 110 to 250 kHz.

13. A system as recited by claim 12, wherein said resonance frequency ranges from about 120 kHz to 200 kHz

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14. A method for detecting a surgical implement left within a patient during surgery in an operating room, comprising the steps of:

a) attaching a marker to said surgical implement before use during said surgery, said marker exhibiting mechanical resonance at a resonant frequency in the presence of an electromagnetic interrogating field, said resonant frequency ranging from about 70 to 300 kHz, whereby said marker is provided with a signal-identifying characteristic;

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b) placing a surgical implement detector proximate said operating room, said detector being adapted to generate said electromagnetic interrogating field and detect said signal-identifying characteristic;

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- c) subjecting said patient to said electromagnetic interrogating field generated by said surgical implement detector;
- d) detecting said signal-identifying characteristic; and
- e) activating an indication means in response to the detection of said signal-identifying characteristic indicative of the presence of said implement.

15. A method as recited by claim 14, further comprising the step of providing a bias means for magnetically biasing and thereby arming said magnetomechanical element to resonate.

16. A method as recited by claim 15, wherein said bias means comprises a bias magnet having a top side and a bottom side.

17. A method as recited by claim 16, wherein said magnetomechanical element comprises a first elongated strip and a second elongated strip, each strip being composed of magnetostrictive amorphous metal alloy, said first elongated strip is disposed on said top side of said bias magnet and said second side is disposed on said bottom side of said bias magnet, and the planes of said first and second elongated strips are substantially parallel.

18. A method as recited by claim 14, wherein said magnetomechanical element comprises at least one elongated strip composed of magnetostrictive amorphous metal alloy.

19. A method as recited by claim 18, wherein said magnetomechanical element comprises a plurality of elongated strips composed of magnetostrictive amorphous metal alloy.

20. A method for detecting a surgical implement left within a patient during surgery in an operating room, comprising the steps of:

- 5 a) attaching a marker to said surgical implement before use during said surgery, said marker comprising a magnetomechanical element having plurality of elongated strips of magnetostrictive amorphous metal adapted to resonate at a resonant frequency in the presence of an electromagnetic interrogating field, whereby said marker is provided with a signal-identifying characteristic, and said strips in said marker being disposed in a
- 10 non-parallel orientation;
- b) placing a surgical implement detector proximate said operating room, said detector being adapted to generate said electromagnetic interrogating field and detect said signal-identifying characteristic;
- 15 c) subjecting said patient to said electromagnetic interrogating field generated by said surgical implement detector;
- d) detecting said signal-identifying characteristic with said surgical implement detector; and
- e) activating an indication means in response to the detection of said signal-identifying characteristic indicative of the presence of said implement.

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21. A method for detecting a surgical implement left within a patient during surgery in an operating room, comprising the steps of:

- 25 a) attaching a marker to said surgical implement before use during said surgery, said marker comprising: a magnetomechanical element having a first elongated strip and a second elongated strip, each of said strips being composed of magnetostrictive amorphous metal and exhibiting mechanical

resonance at a resonant frequency in the presence of an electromagnetic interrogating field, whereby said marker is provided with a signal-identifying characteristic; a bias magnet having a top side and a bottom side, said magnet arming said first and second elongated strips to undergo resonance; and wherein said first elongated strip is disposed on said top side of said bias magnet and said second elongated strip is disposed on said bottom side of said bias magnet;

- b) placing a surgical implement detector proximate said operating room, said detector being adapted to generate said electromagnetic interrogating field and detect said signal-identifying characteristic;
- c) subjecting said patient to said electromagnetic interrogating field generated by said surgical implement detector;
- d) detecting said signal-identifying characteristic with said surgical implement detector; and
- e) activating an indication means in response to the detection of said signal-identifying characteristic indicative of the presence of said implement.

22. In a surgical implement, the improvement wherein a magnetomechanical marker detectable by an electronic article surveillance system is attached to the implement, the marker comprising:

- a) a magnetomechanical element comprising one or more elongated strips composed of magnetostrictive amorphous metal alloy;
- b) a housing having at least one cavity sized and shaped to accommodate said strips, and said strips being disposed in said cavity and able to mechanically vibrate freely therewithin; and

- c) a bias means for magnetically biasing said magnetomechanical element, said magnetomechanical element being armed to resonate at a resonant frequency in the presence of an interrogating electromagnetic field, said resonant frequency ranging from about 70 to 300 kHz.

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23. In a surgical implement, the improvement wherein a magnetomechanical marker detectable by an electronic article surveillance system is attached to the implement, the marker comprising:

- a) a magnetomechanical element comprising a plurality of elongated strips  
10 composed of magnetostrictive amorphous metal alloy;
- b) a housing having at least one cavity sized and shaped to accommodate said strips, and said strips being disposed in said cavity with a non-parallel orientation and able to mechanically vibrate freely therewithin; and
- c) a bias means for magnetically biasing said magnetomechanical element,  
15 whereby said magnetomechanical element is armed to resonate at a resonant frequency in the presence of an interrogating electromagnetic field.

24. In a surgical implement, the improvement wherein a magnetomechanical  
20 marker detectable by an electronic article surveillance system is attached to the implement, the marker comprising:

- a) a magnetomechanical element comprising a first and a second elongated strip, each strip being composed of magnetostrictive amorphous metal alloy;
- 25 b) a housing having at least one cavity sized and shaped to accommodate said strips;

- c) a bias magnet magnetically biasing said magnetomechanical element, said bias magnet having a top side and a bottom side, said magnetomechanical element being armed to resonate at a resonant frequency in the presence of an interrogating electromagnetic field;
- 5 d) said first elongated strip being disposed on said top side of said bias magnet and said second elongated strip being disposed on said bottom said of said bias magnet.